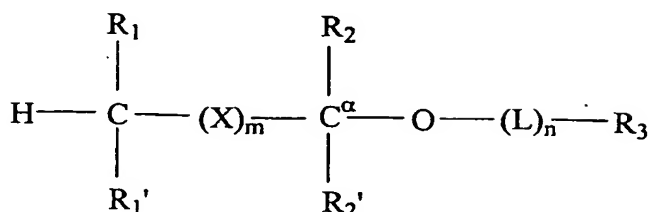


WHAT IS CLAIMED IS:

1. A phosphonate compound having the structure:



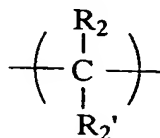
wherein:

R_1 and R_1' are independently -H, optionally substituted
-O(C₁-C₂₄)alkyl, -O(C₁-C₂₄)alkenyl, -O(C₁-C₂₄)acyl, -S(C₁-C₂₄)alkyl,
-S(C₁-C₂₄)alkenyl, or -S(C₁-C₂₄)acyl, wherein at least one of R_1 and R_1' are
not -H, and wherein said alkenyl or acyl optionally have 1 to about 6 double
bonds,

R_2 and R_2' are independently -H, optionally substituted
-O(C₁-C₇)alkyl, -O(C₁-C₇)alkenyl, -S(C₁-C₇)alkyl, -S(C₁-C₇)alkenyl,
-O(C₁-C₇)acyl, -S(C₁-C₇)acyl, -N(C₁-C₇)acyl, -NH(C₁-C₇)alkyl,
-N((C₁-C₇)alkyl)₂, oxo, halogen, -NH₂, -OH, or -SH;

R_3 is a phosphonate derivative of a pharmacologically active
compound linked to a functional group on optional linker L or to an available
oxygen atom on C^{α} ;

X, when present, is:



L is a valence bond or a bifunctional linking molecule of the formula

-J-(CR₂)_t-G-, wherein t is an integer from 1 to 24, J and G are independently -O-, -S-, -C(O)O-, or -NH-, and R is -H, substituted or unsubstituted alkyl, or alkenyl;

5 m is an integer from 0 to 6; and
 n is 0 or 1.

2. The phosphonate compound according to claim 1, wherein R₃ is a bisphosphonate.

10

3. The phosphonate compound according to claim 2, wherein the bisphosphonate is alendronate, etidronate, tiludronate, ibandronate, EB-1053, pamidronate, olpadronate, amino-olpadronate, clodronate, or risedronate.

15

4. The phosphonate compound according to claim 1, wherein R₃ is a phosphonate derivative of an antiviral nucleoside.

5. The phosphonate compound according to claim 4, wherein said phosphonate derivative is adefovir, cidofovir, cyclic cidofovir, or tenofovir.

20

6. The phosphonate compound according to claim 4, wherein said phosphonate derivative is a derivative of azidothymidine (AZT).

7. The phosphonate compound according to claim 1, wherein R₃ is a phosphonate derivative of an anti-neoplastic nucleoside.

25

8. The phosphonate compound according to claim 7, wherein said phosphonate is a derivative of cytosine arabinoside, gemcitabine, 5-fluorodeoxyuridine riboside, 5-fluorodeoxyuridine deoxyriboside, 2-chlorodeoxyadenosine, fludarabine, or 1-β-D-arabinofuranosyl-guanine.

30

9. A pharmaceutical composition comprising a phosphonate compound according to claim 1 and a pharmaceutically acceptable carrier therefor.

10. A method for treating osteoporosis in a mammal, said method comprising administering to a subject in need thereof an effective amount of a phosphonate compound according to claim 1.
- 5 11. A method for augmenting bone mineral density, said method comprising administering to a subject in need thereof an effective amount of a phosphonate compound according to claim 1.
- 10 12. A method for preventing osteoblast and osteocyte apoptosis in a mammal, said method comprising administering to a subject in need thereof an effective amount of a phosphonate compound according to claim 1.
- 15 13. A method for treating a viral infection in a mammal, said method comprising administering to a subject in need thereof an effective amount of a phosphonate compound according to claim 1.
- 20 14. A method for treating a growing neoplasm in a mammal, said method comprising administering to a subject in need thereof an effective amount of a phosphonate compound according to claim 1.
15. A method for modulating cell proliferation, said method comprising administering to a subject in need thereof an effective amount of a phosphonate compound according to claim 1.